A. De Rudder and S. Williams *

Rutherford Appleton Laboratory, Chilton OX11 0QX, U.K. — * Now at University of Cardiff, Cardiff, Wales CF10 3BB, U.K.

Introduction

The British Atmospheric Data Centre (BADC) is the body designated to archive, maintain and distribute atmospheric data generated by research projects pursued under the auspices of the British Natural Environment Research Council (NERC).

Figure 1. The menu of the BADC Web home page offers the user the possibility to browse the data archive directly, use the various search engines, consult the documentation or access a variety of services.

Data access

The BADC archive is a file based system from which data files can be directly downloaded *via* the Web. FTP or other transfer means can also be used. With the exception of ECMWF data, for which particular rules apply, most data sets are available to the academic community world-wide. A large part of the data are of public access. In the case of restricted data, access is granted on request and is password protected. Figure 1 displays the current aspect of the BADC Web home page.

Documentation and tools

All data sets are documented online (Figure 2). This documentation includes scientific information on the data (such as collection and validation procedures,

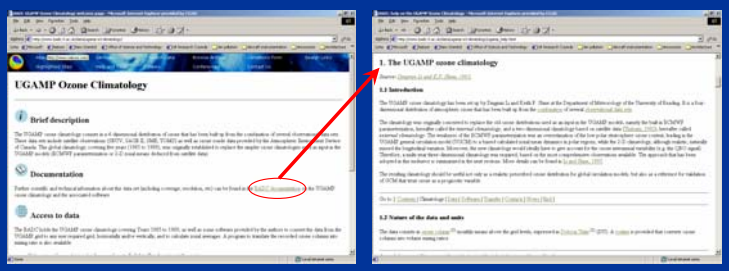

Figure 2. An example of a BADC data set front page top with the link to the associated documentation page. The example shows the documentation on the 4-dimensional (5 years, global, ground level to mesosphere) ozone climatology built by K. Shine and D. Li (University of Reading) from a combination of satellite and ozone-sonde measurements. This data set is of public access.

conditions of model run, etc.) and technical details to allow the user to read the data (format, etc.). Software to read the data, as well as plotting facilities, are often provided (Figure 3).

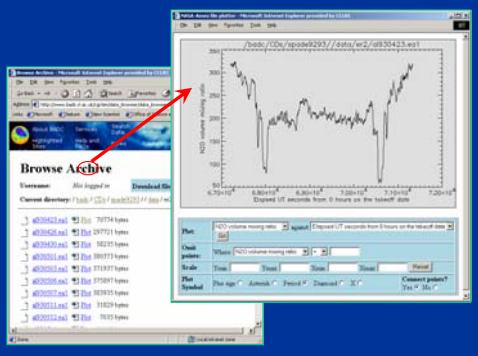

Figure 3. A quick-plot facility allows the user to view many of the data online. Here, nitrous oxide mixing ratio as a function of time along a flight-track of ER2 during the SPADE NASA aircraft campaign of 1992-1993 (flight of 23 April 1993). This data set is publicly available.

Data sources

Data sets acquired or mirrored by BADC originate from international programmes (*e.g.* CIRA from COSPAR, NDSC data mirrored from the NDSC home site), European research programmes (*e.g.* ECMWF, EASOE, GOME), other data centres (*e.g.* data from NASA campaigns, SPARC) and UK based researchers (Met Office data, NERC research programmes such as the Upper Troposphere/Lower Stratosphere programme 'UTLS-Ozone' that includes field observations, modelling and laboratory kinetic studies — data from this programme are restricted to UTLS participants for now but will be released to the public 18 months after their date of submission to BADC).

Data sets

BADC holds a large variety of stratospheric and mesospheric data sets of chemical species concentrations and dynamical variables, from local *in situ* to global satellite observations and from raw measurements to model output, including results from calculations based on data assimilation techniques. It also holds some data of relevance for middle atmospheric science (such as the ESA H_2O absorption cross sections intended to support GOME data interpretation), for the detection of climate change (FIRETRAC, GEDEX) and for the coupling with the troposphere and the ocean.

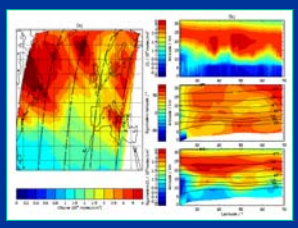

Figure 4. GOME retrievals during March 1997. (a) Retrieved ozone concentration on the 16 km surface for 8 March 1997. (b) Height versus latitude distributions; top: retrieved field from orbit commencing 9:20 on 7 March 1997; middle: equivalent latitude derived from met Office potential vorticity along same track; bottom: "equivalent O_3" derived by interpolating climatological ozone zonal mean to equivalent latitude field – *i.e.* expected ozone based on dynamics according to Met Office. Note reasonable qualitative agreement in lower stratosphere: although GOME has relatively poor vertical resolution, it captures the horizontal structure reasonably well.
Courtesy of Richard Siddans and Brian Kerridge.

Examples of data sets of direct interest for the study of the stratosphere are illustrated in Figures 4 and 5. Figure 4 displays results of a study based on ozone data from the Global Ozone Monitoring Experiment (GOME) aboard the ERS-2 satellite. GOME data can be accessed on request. Figure 5 displays an example of Met Office assimilated temperature and TOMS total ozone above the South Pole.

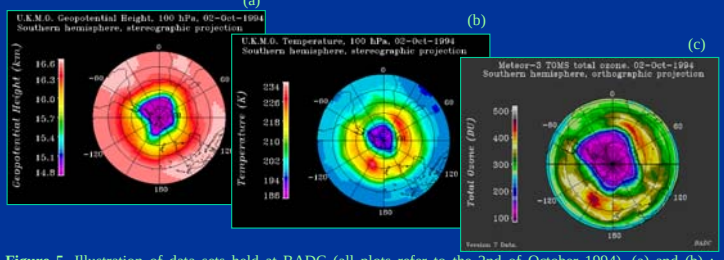

Figure 5. Illustration of data sets held at BADC (all plots refer to the 2nd of October 1994). (a) and (b) : geopotential height (km) and temperature (K) at the 100 hPa level over the Southern hemisphere, from the Met Office assimilated data set – access to this data set is granted on request –; (c) total ozone column over the same region, showing the extent of the ozone hole at that date, as measured by the Total Ozone Mass Spectrometer (TOMS) aboard Meteor-3 (of public access).

Services

In addition to providing scientists with a centralised archive and sharing facilities, BADC also supplies both scientific and technical support in issues related to data. This includes the acquisition of data required by NERC-funded researchers, support in formatting or understanding data, links to relevant sources of information,… An online helpdesk answers queries within a day of receipt. Figure 6 illustrates the use of the online trajectory calculator, a service which has been extensively used in the course of several observation campaigns.

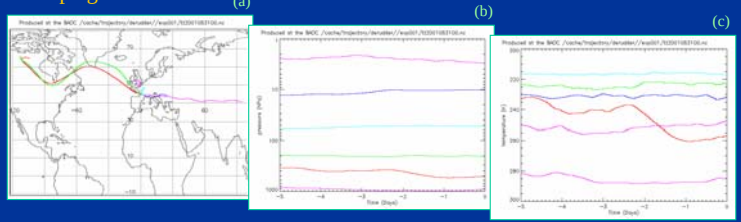

Figure 6. An online trajectory calculator using the assimilated ECMWF dynamical fields allows the user to calculate forward or backward trajectories and plot their projection onto a 2-dimensional cross-section of the spatiotemporal space. The code is currently being updated to use also the Unified Model (UM) dynamics. The option is offered to use pressure or potential temperature (for isentropic trajectories) as the vertical coordinate. Numeric data can be downloaded in different formats. The example shows 3-D 5-day back trajectories arriving above Arcachon on August 31st, 2001 at 0:00 am, as a function of (a) longitude, latitude; (b) time, pressure; (c) time, temperature. Colours correspond to the different pressure levels of 900, 500, 200, 50, 10 and 3 hPa[see Figure (b)].

The future

BADC is in continuous evolution due the nature of its role. Meeting the scientists' needs in terms of data not only implies the broadening of the archive but also the provision of a larger range of better performing tools. Highlights among the developments in the near-future include for example the distribution of Numerical Weather Prediction (NWP) data from the Met Office as well as the ERA-40 reanalysis from ECMWF and the transition to an integrated grid-based archive, distribution and calculation system. The BADC staff involvement in research activities (clouds, data assimilation) is also currently growing.